FIRE STATION 31
TEST PROTOCOL

Prepared for

FIRE STATION 31 HEALTH INVESTIGATION
INTERDEPARTMENTAL TASK FORCE

By PREZANT ASSOCIATES, INC.

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PHASE 1. IDENTIFY CURRENT HEALTH HAZARDS

A. Contaminants to be Measured

Prezant Associates, Inc. (Prezant) proposes that testing in Fire Station 31 initially include the following health hazards:

Arsenic: a naturally occurring metal that is often distributed widely in the environment from the exhaust from copper smelters. Skin and inhalation exposure to arsenic has been associated with cancer in humans.

Asbestos: a mineral fiber that has long been used in a variety of building construction materials for insulation and as a fire-retardant. Inhalation of asbestos increases the long-term risk of chest and abdominal cancers and lung diseases.

Benzene: a component of gasoline and other industrial solvents. Benzene has been demonstrated to increase the risk of leukemia (a blood cancer) in humans based on epidemiological studies.

Cadmium: Fumes are contacted during exposure to heated metals (plating operations, welding, etc.). Chronic inhalation may cause emphysema, kidney damage, or increased risk of cancer.

Chromium, hexavalent: Ferrochrome alloys have been associated with lung disease in humans and certain forms of chromium (VI) compounds have been found to increase the risk of respiratory cancer.

Diesel particulate matter (DPM): tiny solid particles produced from diesel-powered internal combustion engines, consisting of a solid core of carbon containing a soluble organic fraction, sulfates, and trace elements. The particles are generally less than 1 um in diameter and consequently can be inhaled deep into the lungs. Exposure to DPM increases the risk of lung cancer.

Polycyclic aromatic hydrocarbons (PAHs): standard products of combustion, including automobiles, trucks, airplanes, fires, and even charcoal broiled foods. Exposure to PAHs the risk of cancer.

Silica, crystalline: Silica, or silicon dioxide, is naturally occurring minerals like quartz, cristobalite, and tridymite. When grinded or abraded, the dust can cause silicosis, an inflammation of the lung tissue that can obstruct the flow of oxygen into the lungs and blood. Silica exposure most often occurs in people who work in construction, mining, sandblasting, stonecutting, abrasives manufacturing, glass manufacture, and pottery. In addition, silicosis patients are at an increased risk for getting tuberculosis, heart disease, lung cancer, and connective tissue disease.

Radon: a radioactive gas that comes from the natural decay of uranium that is found in some soils. Buildings above such soils may traps radon inside, where it can build up and lead to an increased risk of lung cancer.

Radio Frequency (RF): Radiofrequency (RF) radiation is electromagnetic radiation in the frequency ranges 3 kilohertz (kHz) - 300 Megahertz (MHz). Use of RF includes radios, cellular phones, and communications transmitters. The primary health effect of RF is a result of heating in deep body organs, but other effects are being studied.

Carbon monoxide (CO): CO is a gas formed from internal combustion engines and fires. It is toxic by reducing the oxygen carrying capacity of the blood. Exposure to concentrations above 1000 ppm can result in coma and death. Symptoms at lower levels include headache, dizziness, nausea, and drowsiness.

Carbon dioxide: This is a colorless odorless gas that is a normal component of the atmosphere, coming from the normal breathing of animals. It is generally present at about 350 ppm. When higher levels are present, it may be an indicator that inadequate air changes are occurring in an occupied structure.

Temperature: High temperatures can cause more accidents to occur because it lowers concentration levels. Dehydration caused by loss of fluids due to perspiration gives rise to cramps, headache, and fatigue. Heat stress causes symptoms of nausea, extreme tiredness, dizziness, clammy skin, racing pulse, fainting, and lower levels of concentration. Heat stroke occurs if the blood temperature exceeds 102°F and can cause confusion, incoherent speech, convulsions, organ damage, and possible death.

Humidity: Humid or damp conditions encourage the growth of mold and can cause discomfort to occupants. Low humidity can cause eye irritation and increase susceptibility to bacterial or viral illnesses.

Lead: a naturally occurring metal that can cause severe kidney, blood, neurological, and reproductive effects. Commonly found in older paints and in indoor firing ranges, where lead dust can be deposited on walls and floors.

Mercury: a naturally occurring metal that can cause severe neurological effects. Lead is commonly found in many batteries (electronic equipment, mobile telephones, portable computers, and emergency backup lighting), thermostats, and many types of lamps (fluorescent lights, mercury vapor, high pressure sodium, and metal halide lamps).

Mold: Molds are forms of fungi found both indoors and outdoors. Outdoors, molds live in the soil, on plants, and on dead or decaying matter. Indoors, molds live on dirt and cellulose products such as wood and paper. Molds produce microscopic spores that spread easily through the air. Allergic reactions and irritation are the most common health effects for individuals sensitive to molds. Flu-like symptoms and skin rash may occur. Molds may also aggravate asthma. Infections from building-associated molds may occur in people with serious immune diseases. Most mold symptoms are temporary and eliminated by correcting the mold problem.

Bacteria: Bacteria are often found living in dirt and areas of moisture. Some bacteria are disease-causing, such as *Salmonella typhi* (the cause of typhoid fever), but most are relatively harmless to humans. Most bacterial health symptoms are temporary and eliminated by removing the bacteria or treating the patient with antibiotics.

Respirable dust: airborne material which is capable of penetrating to the gas-exchange region of the lungs. Depending on the dust content, effects can range from irritation to severe diseases.

Volatile organic compounds (VOCs): are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects. VOCs are emitted by a wide array of products including solvents, gasoline, paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, copiers, printers, and adhesives.

PCBs: generic term for a range of polychlorinated biphenyl compounds used commercially in heat transfer media and in the chemical/coatings industry. Prolonged skin contact with PCBs may cause acne-like symptoms, known as chloracne. Irritation to eyes, nose and throat may also occur. Acute and chronic exposure can cause liver damage, and symptoms of edema, jaundice, anorexia, nausea, abdominal pains, and fatigue. PCBs are a suspect carcinogen.

B. Carcinogens that will not be specifically measured

The following substances are known to be human carcinogens (National Toxicology Program, 10th Annual Report on Carcinogens). Carcinogens listed in **boldface** will be tested, but the others will not be specifically tested, as they are unlikely to be present or are not appropriate for testing in this scope of work for the reasons stated.

Aflatoxins – substance found in moldy peanuts.
Alcoholic beverage consumption – personal habit.
4-Aminobiphenyl – not in general use in industry or commerce.
Analgesic mixtures containing pheacetin – prescription drug.
Arsenic compounds, inorganic.
Asbestos.
Azathioprine – prescription immunosuppressant drug.
Benzene.
Benzidine and dyes metabolized to benzidine – manufacture and use of dyes.
Beryllium and beryllium compounds – manufacture of atomic weapons.
1,3-Butadiene – manufacture of certain rubber compounds.
1,4 butanediol dimethylsulfone - not in general use in industry or commerce.
Cadmium and cadmium compounds.
Chlorambucil – prescription drug used to treat cancer.
MeCCNU – prescription drug used to treat cancer.
bis(chloromethyl) ether and technical grade chloromethyl methyl ether - not in general use in industry or commerce.

Chromium hexavalent compounds.
Coal tar pitches and coal tar – roofing and road asphalting – essentially the same compounds as PAHs (soots).
Coke oven emissions – industrial coke production for the steel industry.
Cyclophosphamide – prescription drug used in cancer treatment.
Cyclosporin A – prescription drug used in cancer treatment.
Diethylstilbestrol (DES) – prescription drug formerly used to prevent morning sickness and miscarriage in pregnant women.
Erionite – naturally occurring fibrous mineral resembling asbestos, not in current use.
Estrogens, steroidal – prescription drug.
Ethylene oxide – used in sterilization of hospital equipment.
Melphalan – prescription drug used in cancer treatment.
PUVA - combination of psoralen (P) and long-wave ultraviolet radiation (UVA) used to treat several severe skin conditions.
Mineral Oils (untreated and mildly treated) – used in the manufacture of automobiles, airplanes and parts, steel products, screws, pipes, precision parts, transformers, brass and aluminum production, engine repair, copper mining, and newspaper and commercial printing.
Mustard gas – used in chemical warfare.
2-Naphthylamine - not in general use in industry or commerce, only used for research purposes.
Nickel compounds – component of stainless steel, superalloys (e.g., Inconel 600) or nonferrous alloys (e.g., cupronickel).
Radon.
Silica, crystalline (respirable size).
Solar and ultraviolet radiation – occurs outdoors and in tanning booths, blocked by glass windows.
Soots – essentially the same compounds as PAHs.
Strong inorganic acid mists containing sulfuric acid – industrial processes involving acid baths.
Tamoxifen – drug used to treat breast cancer that increases risk of uterine cancer.
TCDD (tetrachlorodibenzodioxin)– combustion product of pentachlorophenol and a contaminant in Agent Orange.
Thiotepa – prescription chemotherapeutic agent.
Thorium dioxide - used in high temperature ceramics, gas mantles, nuclear fuel, flame spraying, crucibles,
medicines, nonsilica optical glass, thoriated tungsten filaments, and as a catalyst.
Tobacco smoking, environmental tobacco smoke, and smokeless tobacco – personal habit.
Vinyl chloride – used in severely regulated industrial processes and found as degradation product of chlorinated compounds in many municipal landfills.
Wood dust – generally from working with hardwoods used in fine furniture manufacture.

C. Testing Methods and Limits

1. Tests to determine if there are any airborne carcinogens present.

Prezant will test the air both inside and outside (for background comparison) for known human carcinogens listed in Table 1. If the limits in **boldface** are exceeded, immediate response would

be indicated. Such response could include steps ranging from immediate retesting with a similar or more sensitive method, up to evacuation of affected portions of the building and substantial cleaning efforts.

Table 1 – Air Test Methods for Known Carcinogens

		Limits			
Chemical	**Method**	**PEL[1]**	**REL[2]**	**EPA[3]**	**Other**
Arsenic, inorganic	NIOSH 7300	**0.01 mg/m^3**	0.002 mg/m^3 (15-min)	NE	
Asbestos	TEM	0.1 f/cc	0.1 f/cc	**0.01 f/cc (background)**	
Benzene	OSHA 12	1 ppm	**0.1 ppm**	NE	
Cadmium	NIOSH 7048	**0.005 mg/m^3**	NE	NE	
Chromium, hexavalent	NIOSH 7024	0.05 mg/m^3	**0.001 mg/m^3**	NE	
Diesel particulate matter (DPM)	NIOSH 5040	NE	NE	NE	**0.02 mg/m^3** as elemental carbon (ACGIH – withdrawn notice of intended change)
Polycyclic aromatic hydrocarbons (PAHs)	NIOSH 5506	0.2 mg/m^3 as coal tar pitch volatiles	**0.1 mg/m^3** as cyclohexane extractable fraction		
Radon	Carbon canister	NE	NE	**4 pCi/L**	
Silica, crystalline	NIOSH 7500	0.05 mg/m^3	**0.05 mg/m^3**		

[1] PEL – Permissible Exposure Limit (WISHA) – 8-hr Time Weighted Average (TWA)
[2] REL -- Recommended Exposure Limit (NIOSH) – 10-hr TWA
[3] EPA – Environmental Protection Agency Recommendation
NE – Not established

1. Tests to determine if there are other airborne health hazards present.

Prezant will test the air both inside and outside (for background comparison) for other known airborne health hazards listed in Table 2. If the limits in **boldface** are exceeded, immediate response would be indicated. Such response could include steps ranging from immediate retesting with a similar or more sensitive method, up to evacuation of affected portions of the building and substantial cleaning efforts.

Table 2 – Air Test Methods for Other Known Health Hazards

		Limits			
Hazard	**Method**	**PEL[1]**	**REL[2]**	**EPA[3]**	**Other**
Carbon monoxide (CO)	IAQ Calc	35 ppm	35 ppm		**25 ppm ACGIH**
Carbon dioxide	IAQ Calc	5,000 ppm	5,000 ppm		**1,000 ppm ASHRAE odor control**
Temperature	IAQ Calc	NE	NE	NE	**68°–74° F (winter); 73°–79° F (summer), ASHRAE comfort**
Humidity	IAQ Calc	NE	NE	NE	**30-50% ASHRAE comfort**
Lead	NIOSH 7082	**0.05 mg/m^3**	0.05 mg/m^3		
Mercury	NIOSH 6009	**0.05 mg/m^3**	0.05 mg/m^3		
Mold	Anderson 5-plate	NE	NE	NE	**Substantially higher than outdoors**
Bacteria		NE	NE	NE	**Substantially higher than outdoors**
Respirable dust	NIOSH 0600	**5 mg/m^3**			
Volatile organic compounds (VOCs)	NIOSH 1500	Various	**Various**		

[1] PEL – Permissible Exposure Limit (WISHA) – 8-hr Time Weighted Average (TWA)
[2] REL -- Recommended Exposure Limit (NIOSH) – 8-hr TWA
[3] EPA – Environmental Protection Agency Recommendation
NE – Not established

3. Other Tests for Known Health Hazards

Prezant will test surfaces or bulk materials inside (and outside, where appropriate, for background comparison) for other known health hazards listed in Table 3. If the limits in **boldface** are exceeded, immediate response would be indicated. Such response could include steps ranging from immediate retesting with a similar or more sensitive method, up to evacuation of affected portions of the building and substantial cleaning efforts.

Table 3 – Test Methods for Other Known Health Hazards

	Compound	**Method**	**EPA[1]**	**Other**
Soil in basement	Lead	Bulk	NE	**250 mg/kg** residential (MTCA)
Basement walls of firing range	Lead	Wipe	**40 ug/ft^2**	
Surfaces where fluorescent and other lights are stored or were broken	Mercury	Wipe	NE	**Above detection limit.**
Fluorescent light ballasts	PCBs	Visual inspection of surface	NE	**Any leakage from ballast without "No PCB" label**
Damp wood/paper	Mold	Bulk or wipe	NE	**Significant growth**
Damp surfaces	Bacteria	Bulk or wipe	NE	**Significant growth**
Tiles, pipes	Asbestos	Bulk – PCM	**1%**	

	Compound	Method	EPA[1]	Other
Settled dust	Components	Bulk	NE	**Significant amount of non-expected substances (i.e., not pollen, paper, or skin)**
Bunker gear storage areas, laundry area	PAHs	Bulk	NE	**Above outdoor levels**
Bricks	Sealant	Bulk	NE	
Bricks	"White stuff"	Bulk	NE	
Drinking water	Lead	Bulk	**0.015 mg/L**	
Radiofrequency (RF)		RF Meter	NE	See **47 CFR 1.1310** (FCC)

[1] EPA – Environmental Protection Agency Requirement
NE – Not established

D. Evaluate Health Hazards of Products Currently in Use

Prezant will review the MSDS for each chemical product currently in use, and determine the chemical constituents, any known or suspect human carcinogens among those constituents, and any other known or suspected human health hazards. We will attempt to observe how products with known carcinogens or other health hazards are actually used, and if any are suspected to result in exposure to firefighters, we will propose additional tests to determine the exposure levels.

PHASE 2: IDENTIFY PAST HEALTH HAZARDS

Either independently or in conjunction with the Epidemiological study, Prezant will attempt to identify the nature and extent of health hazards that might have been present in the fire station in the past. Such items might include tobacco smoke, soot, asbestos, herbicides, pesticides, chlorinated cleaning and degreasing compounds and solvent-based paints and thinners.